CLAIMS

What is claimed is:

1. A method for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the method comprising selecting, from a plurality of channels in the communications system, a first set of channels and a second set of channels, in order to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a performance characteristic of one or more channels in the plurality of channels to improve.

2. A method as recited in Claim 1, further comprising selecting the first set of channels and the second set of channels to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a margin of the one or more channels in the communications system to improve.

3. A method as recited in Claim 1, further comprising selecting the first set of channels and the second set of channels to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a margin characteristic of the one or more channels in the communications system to improve.

4. A method as recited in Claim 1, wherein selecting the first set of channels includes selecting the first set of channels based on a margin of a channel in the first set of channels compared to a margin of the one or more other channels in the plurality of channels.

5. A method as recited in Claim 1, further comprising re-assigning one or more bits from the first set of channels to the second set of channels so as to cause a performance characteristic of the one or more channels in the communications system to improve.

6. A method as recited in Claim 5, further comprising adjusting a gain of the first set of channels and a gain of the second set of channels in response to re-assigning one or more bits from the first set of channels to the second set of channels.

7. A method as recited in Claim 1, wherein adjusting a gain from the first set of channels and a gain from the second set of channels includes adjusting the gain from the first set of channels and the gain from the second set of channels so that an aggregate gain total of the plurality of channels before re-assigning one or more bits from the first set of channels to the second set of channels is approximately equal to the aggregate gain total of the plurality of channels after re-assigning one or more bits from the first set of channels to the second set of channels.

8. A method as recited in Claim 1, wherein selecting a first set of channels and a second set of channels includes determining channels in the plurality of channels that have bits available for reduction, and channels in the plurality of channels that have sufficient capability for carrying the number of bits for reduction on the first set of channels in addition to an existing number of bits assigned to that channel.

9. A method as recited in Claim 1, wherein selecting a first set of channels and a second set of channels includes selecting at least one channel having a high margin, and at least one channel having a low margin, and wherein the method further comprises re-assigning a designated number of bits from the at least one channel having the low margin to the at least one channel having the high margin.

10. A method as recited in Claim 9, re-assigning a designated number of bits from the at least one channel having the low margin to the at least one channel having the high margin includes re-assigning a single bit from the at least one channel having low high margin to the at least one channel having the high margin.

11. A method for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the method comprising:

selecting a first channel and a second channel in a plurality of channels in response to determining (i) that a difference between a performance characteristic of the first channel and of the second channel is greater than a threshold value, and (ii) that re-

assigning one or more bits from the first channel to the second channel satisfies a bit constraint of the communications system; and

re-assigning the one or more bits from the first channel to the second channel to cause the difference between the performance characteristic of the first channel and of the second channel to be reduced.

12. A method as recited in Claim 11, further comprising selecting the first channel and the second channel by determining that re-assigning a gain from the first channel to the second channel, in order to accommodate re-assigning bits from the first channel to the second channel, satisfies a gain constraint of the communications system.

13. A method as recited in Claim 12, further comprising re-assigning the gain from the first channel to the second channel so that an aggregate total of the gain assigned to the plurality of channels remains approximately unchanged.

14. A method as recited in Claim 11, wherein re-assigning bits from the first channel to the second channel to reduce the difference between the performance characteristic of the first channel and of the second channel includes reducing the difference between a signal to noise ratio of the first channel and a signal to noise ratio of the second channel.

15. A method as recited in Claim 11, wherein re-assigning bits from the first channel to the second channel to reduce the difference between the performance characteristic of the first channel and of the second channel includes reducing the difference between a margin of the first channel and a margin of the second channel.

16. A method as recited in Claim 15, wherein reducing the difference between a margin of the first channel and a margin of the second channel includes reducing the margin of the first channel and increasing the margin of the second channel.

17. A method for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the method comprising:

re-assigning one or more bits from a first channel in a plurality of channels to a second channel in a plurality of channel, and re-assigning a first gain from the first channel to the second channel, if (i) a difference between a performance characteristic of the first channel and of the second channel will be reduced, and (ii) re-assigning the one or more bits from the first channel to the second channel will satisfy a bit constraint of the communications system; else

making a determination as to whether re-assigning a second gain from the first channel to the second channel will (i) reduce a difference between a performance characteristic of the first channel and of the second channel, and (ii)satisfy a gain constraint of the communications system.

18. A method as recited in Claim 17, further comprising re-assigning one or more bits from the first channel to the second channel if a difference in a margin of the first channel and of the second channel will be reduced.

19. A method as recited in 17, further comprising re-assigning the second gain from the first channel to the second channel in response to making the determination, without re-assigning a bit on the first channel or on the second channel.

20. A method as recited in 17, further comprising selecting the first channel and the second channel based on the first channel having a margin value that is less than a lower threshold value, and the second channel having a margin value that exceeds an upper threshold value.

21. A method as recited in 17, further comprising selecting the first channel and the second channel based on the first channel having a gain level that is less than a lower threshold value, and the second channel having a gain level exceeding an upper threshold value.

22. A communication device for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the communication device being configured to select, from a plurality of channels in the communications system, a first set of channels and a second set of channels, and to re-assign one or more bits from the first set

of channels to the second set of channels so as to cause a performance characteristic of one or more channels in the communications system to improve.

23. A communication device as recited in Claim 22, wherein the communication device is configured to select the first set of channels and the second set of channels, and to re-assign one or more bits from the first set of channels to the second set of channel so as to cause a margin of one or more channels in the communications system to improve.

24. A communication device as recited in Claim 22, wherein the communication device is configured to select the first set of channels and the second set of channels, and to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a signal to noise ratio characteristic of one or more channels in the communications system to improve.

25. A communication device as recited in Claim 22, wherein the communication device is configured to select the first set of channels based on a margin of a channel in the first set of channels compared to a margin of one or more other channels in the plurality of channels.

26. A communication device as recited in Claim 22, wherein the communication device is configured to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a performance characteristic of one or more channels in the communications system to improve.

27. A communication device as recited in Claim 26, wherein the communication device is configured to adjust a gain from the first set of channels and a gain from the second set of channels in response to re-assigning one or more bits from the first set of channels to the second set of channels.

28. A communication device as recited in Claim 22, wherein the communication device is configured to adjust a gain from the first set of channels and a gain from the second set of channels by adjusting the gain from the first set of channels and the gain from the second

set of channels so that an aggregate gain total of the plurality of channels before re-assigning one or more bits from the first set of channels to the second set of channels is approximately equal to the aggregate gain total of the plurality of channels after re-assigning one or more bits from the first set of channels to the second set of channels.

29. A communication device as recited in Claim 22, wherein the communication device is configured to select a first set of channels and a second set of channels by determining which channels in the plurality of channels have bits available for reduction, and which channels in the plurality of channels have sufficient capability for carrying the number of bits for reduction on the first set of channels in addition to an existing number of bits assigned to that channel.

30. A communication device as recited in Claim 22, wherein the communication device is configured to select at least one channel having a high margin, and one channel having a low margin, and to re-assigning a designated number of bits from the channel having the low margin to the channel having the high margin.

31. A communication device as recited in Claim 30, wherein the communication device is configured to re-assign a single bit from the channel having low margin to the channel having the high margin.

32. A computer-readable medium for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the computer-readable medium carrying instructions for performing the step of selecting, from a plurality of channels in the communications system, a first set of channels and a second set of channels, in order to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a performance characteristic of one or more channels in the plurality of channels to improve.

33. A computer-readable medium as recited in Claim 32, further carrying instructions for selecting the first set of channels and the second set of channels to re-assign one or more

bits from the first set of channels to the second set of channels so as to cause a margin of the one or more channels in the communications system to improve.

34. A computer-readable medium as recited in Claim 32, further carrying instructions for selecting the first set of channels and the second set of channels to re-assign one or more bits from the first set of channels to the second set of channels so as to cause a signal to noise ratio characteristic of the one or more channels in the communications system to improve.

35. A computer-readable medium as recited in Claim 32, wherein instructions for selecting the first set of channels include instructions for selecting the first set of channels based on a margin of a channel in the first set of channels compared to a margin of the one or more other channels in the plurality of channels.

36. A computer-readable medium as recited in Claim 32, further carrying instructions for re-assigning one or more bits from the first set of channels to the second set of channels so as to cause a performance characteristic of the one or more channels in the communications system to improve.

37. A computer-readable medium as recited in Claim 36, further carrying instructions for adjusting a gain of the first set of channels and a gain of the second set of channels in response to re-assigning one or more bits from the first set of channels to the second set of channels.

38. A computer-readable medium as recited in Claim 32, wherein instructions for adjusting a gain from the first set of channels and a gain from the second set of channels include instructions for adjusting the gain from the first set of channels and the gain from the second set of channels so that an aggregate gain total of the plurality of channels before re-assigning one or more bits from the first set of channels to the second set of channels is approximately equal to the aggregate gain total of the plurality of channels after re-assigning one or more bits from the first set of channels to the second set of channels.

39. A computer-readable medium as recited in Claim 32, wherein instructions for selecting a first set of channels and a second set of channels include instructions for determining channels in the plurality of channels that have bits available for reduction, and instructions for channels in the plurality of channels that have sufficient capability for carrying the number of bits for reduction on the first set of channels in addition to an existing number of bits assigned to that channel.

40. A computer-readable medium as recited in Claim 32, wherein instructions for selecting a first set of channels and a second set of channels include instructions for selecting at least one channel having a high margin, and at least one channel having a low margin, and wherein the computer-readable medium further comprises instructions for re-assigning a designated number of bits from the at least one channel having the low margin to the at least one channel having the high margin.

41. A computer-readable medium as recited in Claim 40, wherein instructions for re-assigning a designated number of bits from the at least one channel having the low margin to the at least one channel having the high margin include instructions for re-assigning a single bit from the at least one channel having low high margin to the at least one channel having the high margin.

42. A computer-readable medium for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the computer-readable medium carrying instructions for performing the steps of:

selecting a first channel and a second channel in a plurality of channels in response to determining (i) that a difference between a performance characteristic of the first channel and of the second channel is less than a threshold value, and (ii) that re-assigning one or more bits from the first channel to the second channel satisfies a bit constraint of the communications system; and

re-assigning the one or more bits from the first channel to the second channel to cause the difference between the performance characteristic of the first channel and of the second channel to be reduced.

43. A computer-readable medium as recited in Claim 42, further carrying instructions for selecting the first channel and the second channel by determining that re-assigning a gain from the first channel to the second channel, in order to accommodate re-assigning bits from the first channel to the second channel, satisfies a gain constraint of the communications system.

44. A computer-readable medium as recited in Claim 43, further carrying instructions for re-assigning the gain from the first channel to the second channel so that an aggregate total of the gain assigned to the plurality of channels remains approximately unchanged.

45. A computer-readable medium as recited in Claim 42, wherein instructions for re-assigning bits from the first channel to the second channel to reduce the difference between the performance characteristic of the first channel and of the second channel include instructions for reducing the difference between a signal to noise ratio of the first channel and a signal to noise ratio of the second channel.

46. A computer-readable medium as recited in Claim 42, wherein instructions for re-assigning bits from the first channel to the second channel to reduce the difference between the performance characteristic of the first channel and of the second channel include instructions for reducing the difference between a margin of the first channel and a margin of the second channel.

47. A computer-readable medium as recited in Claim 46, wherein instructions for reducing the difference between a margin of the first channel and a margin of the second channel include instructions for reducing the margin of the first channel and increasing the margin of the second channel.

48. A computer-readable medium for adaptively assigning bits to channels of a discrete multi-channel modulation communications system, the computer-readable medium carrying instructions for performing the steps of:

re-assigning one or more bits from a first channel in a plurality of channels to a second channel in a plurality of channel, and re-assigning a first gain from the first

channel to the second channel, if (i) a difference between a performance characteristic of the first channel and of the second channel will be reduced, and (ii) re-assigning the one or more bits from the first channel to the second channel will satisfy a bit constraint of the communications system; else

making a determination as to whether re-assigning a second gain from the first channel to the second channel will (i) reduce a difference between a performance characteristic of the first channel and of the second channel, and (ii)satisfy a gain constraint of the communications system.

49. A computer-readable medium as recited in Claim 48, further carrying instructions for re-assigning one or more bits from the first channel to the second channel if a difference in a margin of the first channel and of the second channel will be reduced.

50. A computer-readable medium as recited in Claim 48, further carrying instructions for re-assigning the second gain from the first channel to the second channel in response to making the determination, without re-assigning a bit on the first channel or on the second channel.

51. A computer-readable medium as recited in Claim 48, further carrying instructions for selecting the first channel and the second channel based on the first channel having a margin value that is less than a lower threshold value, and the second channel having a margin value that exceeds an upper threshold value.

52. A computer-readable medium as recited in Claim 48, further carrying instructions for selecting the first channel and the second channel based on the first channel having a gain level that is less than a lower threshold value, and the second channel having a gain level exceeding an upper threshold value.